CERTIFICATE COURSE ON
BOT2GB – FUNDAMENTALS OF MICROBIOLOGY

Course Description

The Certificate Course on Fundamentals of Microbiology provides a thorough understanding of key microbiological concepts. Delving into microbial morphology, growth, genetics, and diversity, participants explore the intricate world of microorganisms and their applications in various sectors. Practical laboratory sessions offer hands-on experience in techniques such as culturing and staining, enhancing proficiency in microbiological methods. Discussions on ethical considerations and safety guidelines ensure responsible practices in laboratory settings. With insights into microbial pathogenesis, medical microbiology, and industrial applications, students gain valuable knowledge applicable in healthcare, agriculture, biotechnology, and environmental science. This course equips learners with a solid foundation in microbiology, empowering them to pursue further studies or careers in microbiology-related fields with confidence and expertise. Throughout the course, students will engage in hands on laboratory sessions, demonstrations and practical exercise to reinforce their understanding of the theoretical concepts covered. By the end of the course, students will gain practical skills and knowledge essential for pursuing further studies or careers in the field of Microbiology, particularly in botanical research and related disciplines.

PG DEPARTMENT OF BOTANY

Korambayil Ahamed Haji Memorial Unity

Women's College, Manjeri

Certificate Course – 2023-2024

SYLLABUS

CERTIFICATE COURSE ON

FUNDAMENTALS OF MICROBIOLOGY (BOT2GB)

BOT4APB – TOOLS AND TECHNIQUES IN LIFE SCIENCES

Credit: 2

Course Duration: 40 hrs

OBJECTIVES:

1. Provide participants with a comprehensive understanding of basic microbiological principles, including microbial morphology, genetics, and diversity.
2. Equip participants with practical skills in laboratory techniques essential for microbiological studies, such as culturing, staining, and microscopy.
3. Familiarize participants with the applications of microbiology in various fields, including healthcare, agriculture, industry, and environmental science.
4. Foster awareness of ethical considerations and safety guidelines relevant to working with microorganisms, ensuring responsible practices in laboratory settings.

COURSE OUTCOME:

After completion of the course, students will be able to

- The students will be understanding the basic microbiological concepts
- Proficiency in essential laboratory techniques
- Insight into diverse applications of microbiology

Module 1: Introduction to Microbiology **6 Hours**

1. Overview of Microbiology: History, scope, and significance in various fields.
2. Microbial Cell Structure: Detailed study of prokaryotic and eukaryotic cell structures, including cell membrane, cell wall, cytoplasm, and organelles.
3. Microbial Classification: Taxonomy, classification schemes, and characteristics of bacteria, viruses, fungi, protozoa, and algae.
4. Methods in Microbiology: Introduction to laboratory techniques, aseptic techniques, and basic microbiological procedures.

Module 2: Microbial Growth and Metabolism **8 Hours**

1. Microbial Nutrition: Different modes of nutrition in microorganisms, including autotrophs, heterotrophs, and chemotrophs.
2. Microbial Growth: Factors affecting microbial growth, growth curve, and measurement of microbial growth.
3. Microbial Metabolism: Overview of microbial metabolic pathways, including glycolysis, Krebs cycle, fermentation, and oxidative phosphorylation.

4. Microbial Control: Principles of microbial control, physical and chemical methods of microbial control, and antimicrobial agents.

Module 3: Microbial Genetics and Diversity 8 Hours

1. DNA Structure and Replication: Structure and function of DNA, DNA replication, repair, and recombination.
2. Gene Expression and Regulation: Transcription, translation, gene regulation in prokaryotes and eukaryotes, and genetic code.
3. Microbial Genetics: Mutation, gene transfer mechanisms (transformation, transduction, conjugation), and genetic engineering techniques.
4. Microbial Diversity: Biodiversity of microorganisms, microbial ecology, and environmental microbiology.

Module 4: Applied Microbiology and Laboratory Techniques 8 Hours

1. Industrial Microbiology: Applications of microorganisms in various industries, including food, pharmaceuticals, biotechnology, and environmental remediation.
2. Medical Microbiology: Microorganisms and human health, epidemiology, pathogenesis of infectious diseases, diagnosis, and control measures.
3. Laboratory Techniques: Hands-on training in basic microbiological techniques, including microbial culture, staining, microscopy, biochemical tests, and molecular biology techniques.
4. Ethics and Safety in Microbiology: Ethical considerations in microbiological research, biosafety levels, laboratory safety protocols, and waste management.

Practical 10 Hours

1. Microbial Culture Techniques: Hands-on experience in aseptic techniques, streak plating, and isolation of pure cultures from mixed populations.
2. Microscopy: Training in the proper use of light microscopes for observing bacterial, fungal, and protozoal morphology, including staining techniques such as Gram staining and acid-fast staining.
3. Biochemical Tests: Performing biochemical tests to identify microbial species based on their metabolic characteristics, such as carbohydrate fermentation, catalase test, and oxidase test.
4. Molecular Biology Techniques: Introduction to basic molecular biology techniques, including DNA extraction and polymerase chain reaction (PCR).

References

1. "Brock Biology of Microorganisms" by Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, W. Matthew Sattley

2. "Microbiology: An Introduction" by Gerard J. Tortora, Berdell R. Funke, Christine L. Case

3. "Prescott's Microbiology" by Joanne Willey, Linda Sherwood, Christopher J. Woolverton

4. "Microbiology: Principles and Explorations" by Jacquelyn G. Black

5. "Microbiology: A Laboratory Manual" by James G. Cappuccino, Natalie Sherman

6. "Microbiology: Principles and Explorations" by Jacquelyn G. Black

STRATEGIES FOR INSTRUCTION

- Both offline (70%) and online (30%) classes
- Online Platform: Google meet
- Assignment

EVALUATION & GRADING

Scheme of evaluation

Method of evaluation			
Assessment Methods	**Criteria**	**Marks**	**Weightage**
Formative Assessment (FA)	Attendance	4	25%
	Assignment/Project/Activities/Reports	6	
Summative Assessment (SA)	Test Paper	30	75%
	Total	40	100

Attendance

Attendance	**Marks**
90-100%	4
85-89.9%	3
40-84.9%	2
75-79.95	1
<75%	0

GRADING POLICY

Grade	Percentage of total marks (FA+SA)
A	80% & above
B	60-79.9%
C	50-59.9%
D	40-49.9%
Not qualified	**<40%**

MODEL QUESTION PAPER

KAHM UNITY WOMEN'S COLLEGE, MANJERI

DEPARTMENT OF BOTANY

Certificate Course Exam, 2023-2024
FUNDAMENTALS OF MICROBIOLOGY
(BOT2GB)

Time: 1 Hour **Max Marks: 30**

Section A

Answer at least 10 questions. Each question carries 3 marks.

All questions can be attended. Overall ceiling 30.

1. Define microbial classification and provide an example of how microorganisms are classified.
2. Explain the significance of bacterial cell division in microbial growth.
3. Discuss the role of RNA polymerase in the process of transcription.
4. Describe two methods of microbial control and provide an example of their application.
5. Compare and contrast the modes of nutrition between autotrophic and heterotrophic microorganisms.
6. Explain the process of DNA replication in bacteria.
7. Discuss the importance of microbial diversity in industrial applications.
8. Describe the stages of bacterial infection and the host immune response.
9. Define sterilization and disinfection, and provide an example of each method.
10. Explain the significance of antibiotic resistance in microbial populations.
11. Discuss the principles of microbial genetics, focusing on gene transfer mechanisms in bacteria.
12. Describe the role of microorganisms in food spoilage and the measures to prevent foodborne illnesses.
13. Explain the process of translation in bacteria.
14. Discuss the basic techniques used in clinical microbiology for the diagnosis of infectious diseases.
15. Describe the ethical considerations and safety precautions in working with pathogenic microorganisms in laboratories.